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(54) Lock for a door of a motor vehicle

(57) Lock (1) for a door of a motor vehicle, provided with a supporting casing (2), a closing mechanism (4) which is carried on the supporting casing (2), is capable of interacting with a stop (6) and is provided, in turn, with a fork (10) covered externally with a shell (14) made from plastic material and rotatable about its axis (A) between an open position and at least one fully closed position in which the stop (6) is locked in a socket (16) of the fork (10), and a check (11) having an engagement portion (23) which can be snap-coupled to the fork (10) to lock it releasably in the fully closed position; the supporting casing (2) is provided with an arresting element (30) capable of intercepting the fork (10) in a stop position located after the fully closed position along a forward portion of a path for the coupling of the fork (10) to the check (11), and capable of causing a restraining reaction on the fork (10) which moves it into the fully closed position along a return portion of the coupling path opposed to the forward portion; the locking mechanism (4) comprises an elastic leaf spring element (32) made from plastic material, carried integrally by a peripheral edge (22) of the fork (10) and capable of bending when bearing against the arresting element (30) at the end of the forward portion of the coupling path, to produce a braking action on the return portion of the said coupling path.

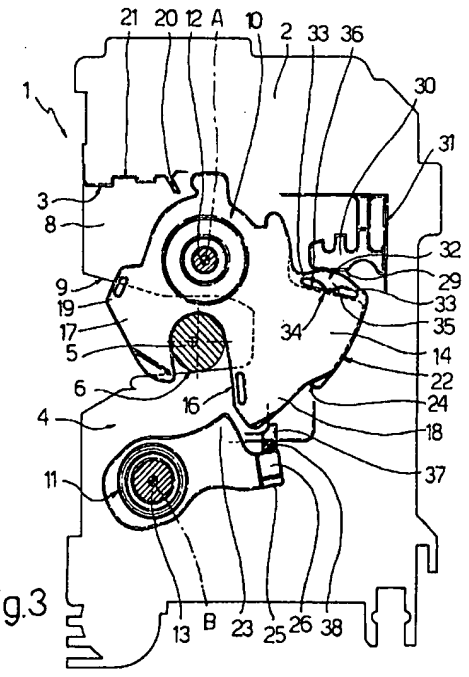

Fig.3

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Description

[0001] The present invention relates to a lock for a door of a motor vehicle.

[0002] It should be made clear that the term "door" is used in its widest sense in the present description and in the claims, to indicate any element movable between a position of opening and a position of closing a gap for access to an internal compartment of a vehicle. The aforesaid term therefore covers not only the side doors of motor vehicles, to which reference will be made in the following text without thereby departing from the general application, but also the front or rear bonnets or hatches.

[0003] As is known, a lock for motor vehicles generally comprises a supporting casing which can be fixed to a door of the motor vehicle, and a locking mechanism carried by the supporting casing and capable of being coupled to a stop integral with a jamb of the door.

[0004] The locking mechanism essentially comprises a fork hinged to the supporting casing about a first fixed pin and having an engagement socket for a generally cylindrical portion of the aforesaid stop, and a check hinged to the supporting casing about a second fixed pin and pushed by a spring so that it snap-fits to a peripheral edge of the fork.

[0005] In particular, the fork, made from metallic material, is generally covered with a shell made from plastic material, is pushed by a corresponding spring towards an open position, in which it permits the engagement and disengagement between the cylindrical portion of the stop and its socket, and is rotatable about the first pin along a path for coupling to the check to take up at least one fully closed position, in which the cylindrical portion of the stop is locked in its socket. The check has an engagement portion which can be snap-coupled to the peripheral edge of the fork to lock the fork releasably in the fully closed position.

[0006] Generally, the supporting casing is provided with a fixed arresting element capable of intercepting the fork in a stop position located after the fully closed position along a forward portion of the path for coupling to the check, and of causing a restraining reaction on the fork to move it into the fully closed position along a return portion of the coupling path opposed to the aforesaid forward portion.

[0007] The rigid contact between the arresting element and the fork has the disadvantage that it causes a rapid return of the fork coupled to the engagement portion of the check, with a consequent high impact noise.

[0008] To avoid this disadvantage, it might be possible to provide a damping rubber block on the said arresting element, to interact with the fork; however, this rubber block would constitute an additional element to be produced and fitted to the supporting casing, resulting in higher manufacturing costs of the lock.

[0009] The object of the present invention is to provide a lock for a door of a motor vehicle which is capable of avoiding in a simple and economical way the disadvantage associated with the known locks as described above, and which, in particular, is capable of considerably reducing the noise generated by its operation.

[0010] The aforesaid object is achieved by the present invention, since it relates to a lock for a door of a motor vehicle, comprising a supporting casing and a locking mechanism carried by the said supporting casing and capable of interacting with a stop, the said locking mechanism comprising:

- a fork made, at least externally, from plastic material, hinged to the said supporting casing about a first axis, provided with a socket for a portion of the said stop, and rotatable about the said first axis between an open position, in which the engagement and disengagement of the said portion of the said stop with and from the said socket is permitted, and at least one fully closed position, in which the said portion of the said stop is locked in the said socket; and
- a check hinged to the said supporting casing about a second axis, pushed by elastic means towards a peripheral edge of the said fork and having an engagement portion which can be snap-coupled to the said peripheral edge to releasably lock the said fork in the said fully closed position;

the said supporting casing comprising first stop means capable of intercepting the said fork in a stop position located after the said fully closed position along a forward portion of a path for coupling the fork to the said check, and of causing a restraining reaction on the said fork to move it into the said fully closed position along a return portion of the coupling path opposed to the said forward portion;

characterized in that the said locking mechanism comprises at least one elastic leaf spring element made from plastic material, carried integrally by the said peripheral edge of the said fork and capable of bending when bearing against the said first stop means at the end of the said forward portion of the said coupling path to cause a braking action on the said return portion of the coupling path.

[0011] For a clearer understanding of the present invention, a preferred embodiment will now be described, purely by way of example, without restriction, and with reference to the attached drawings, in which:

- Figure 1 is a longitudinal section, with parts removed for the sake of clarity, through a lock for a door of a motor vehicle, made according to the present invention and having a locking mechanism set in a first operating position;
- Figure 2 is a longitudinal section, with parts removed for the sake of clarity, through the lock shown in Figure 1, having the locking mechanism set in a second operating position;

- Figure 3 is a longitudinal section, with parts removed for the sake of clarity, through the lock shown in Figure 1, having the locking mechanism in a transitory position between the aforesaid first and second operating positions.

[0012] With reference to the attached figures, the number 1 indicates as a whole a lock for a door of a motor vehicle (the door and vehicle are not illustrated).

[0013] The lock 1 essentially comprises a box-shaped supporting casing 2, capable of being fixed to the aforesaid door and forming within itself a compartment 3 and a locking mechanism 4 housed in the compartment 3 and capable of interacting with a cylindrical portion 5 of a stop 6 represented schematically in section and integral with a fixed jamb (not illustrated) of the door.

[0014] The supporting casing 2 also has a lateral aperture 9 capable of permitting the entry of the portion 5 of the stop 6 into the compartment 3.

[0015] The locking mechanism 4 comprises a fork 10 and a check 11 hinged about pins 12, 13 respectively, which are fixed integrally to the supporting casing 2, extending into the compartment 3 from a back wall 8 of the casing, and have axes A, B respectively which are parallel to each other.

[0016] The fork 10 consists of a shaped plate made from metallic material and covered externally with a shell 14 made from plastic material, is hinged in an intermediate position about the pin 12 and has a C-shaped peripheral socket 16 capable of receiving the portion 5 of the stop 6 and laterally delimited by a pair of teeth 17, 18.

[0017] The fork 10 is also pushed, in a known way, by a spring (not illustrated) wound about the pin 12, towards an open position (Figure 1), in which the socket 16 faces the aperture 9 of the casing 2 and therefore permits the engagement and disengagement of the portion 5 of the stop 6 with and from the locking mechanism 4. More precisely, the open position is defined by the contact between a lateral thickening 19 of the tooth 17 and an extension 20 projecting into the compartment 3 from a wall 21 of the supporting casing 2 located laterally with respect to the aperture 9.

[0018] Under the pressure of the stop 6 and following the slamming of the door, the fork 10 is rotatable about the axis A along a path for coupling by snap-fitting to the check 11 to take up a fully closed position (Figure 2), in which the portion 5 of the stop 6 is locked in the socket 16 and the tooth 17 blocks the aperture 9 in a known way, preventing the stop from emerging.

[0019] The check 11 consists of a shaped plate substantially coplanar with the fork 10 and made from metallic material, located on the opposite side of the fork 10 from the wall 21, and is pushed in a known way by a spring (not illustrated) wound about the pin 13 towards a peripheral edge 22 of the fork 10.

[0020] In particular, the check 11 has an L-shaped edge forming an engagement portion 23 which can be snap-coupled to a free end of the tooth 18 and with a lateral shoulder 24 of the tooth 18 to releasably lock the fork 10 in the fully closed position or in a partial or "first click" position (not illustrated) which is intermediate between the fully open and fully closed positions.

[0021] The check 11 also has a terminal extension 25 projecting laterally from the engagement portion 23, and a peg 26 extending from the extension 25 in a direction substantially parallel to the axes A, B and capable of interacting with a lever mechanism (not illustrated since it does not form part of the present invention) controlling the opening of the lock 1.

[0022] The supporting casing 2 comprises a first arresting element 30 which is integral with a wall 31 of the supporting casing 2 opposite the aperture 9 and substantially orthogonal to the wall 21, and which extends from the wall 31 towards the interior of the compartment 3. The arresting element 30 is capable of intercepting the fork 10 in a stop position (Figure 3) located after the fully closed position along a forward portion of the path for coupling to the check 11, and of causing a restraining reaction on the fork 10 to move it to the fully closed position along a return portion of the coupling path opposite the forward portion.

[0023] According to the present invention, the locking mechanism 4 also comprises an elastic leaf spring element 32 of elongate form, made from plastic material, carried integrally by the peripheral edge 22 of the shell 14 of the fork 10 and capable of bending when bearing against a flat contact surface 29 of the arresting element 30 at the end of the forward portion of the path for coupling to the check 11, to produce a braking action on the subsequent return portion of the coupling path (Figure 3).

[0024] In particular, the elastic element 32 has corresponding end portions 33 integral with a section 34 of the peripheral edge 22 of the fork 10 opposite the tooth 18, and an intermediate portion 35 spaced apart from the aforesaid section 34 and delimiting with the latter a slot 36. In greater detail, the intermediate portion 35 of the elastic element 32 has a cross-section which is wider than the cross-section of the end portions 33 and which projects towards the interior of the slot 36.

[0025] The supporting casing 2 also comprises, within the compartment 3, a second arresting element 37, which forms an end stop for the check 11 in the angular position in which it locks the fork 10 in the fully closed position (Figure 2) and is provided, in turn, with a damper contact element 38, which in this example is a rubber block; more particularly, in operation, the extension 25 of the check 11 interacts with the damper element 38.

[0026] In operation, the lock 1 is closed from outside or inside the motor vehicle simply by slamming the door; this causes an impact of the portion 5 of the stop 6 against the tooth 18 of the fork 10, which rotates in an anticlockwise direction from the open position in Figure

1 towards the fully closed position in Figure 2 along the path for coupling to the check 11.

[0027] The rotation of the fork 10 along the forward portion of the coupling path initially causes the peripheral edge 22 to slide on the engagement portion 23 of the check 11; as soon as the shoulder 24 passes beyond the engagement portion 23 (position of partial closure of the fork 10), the check 11, pushed by the corresponding spring, jumps to a position closer to the fork 10, becoming coupled to the shoulder 24.

[0028] The further rotation of the fork 10 similarly causes the engagement portion 23 to be snap-coupled to the free end of the tooth 18, thus locking the fork 10 in the fully closed position (Figure 2).

[0029] In particular, along the terminal section of the forward portion of the coupling path, the tooth 18 passes beyond the engagement portion 23 of the check 11, thus becoming separated from it, and the elastic element 32 comes into contact with the arresting element 30, bending until its intermediate portion 35 is brought to bear against the edge of the slot 36 facing the intermediate portion 35 (Figure 3).

[0030] The aforesaid bending of the elastic element 32 produces a braking action on the subsequent return portion of the path for coupling the fork 10 to the check 11, thus providing a low-noise damped contact between the free end of the tooth 18 and the engagement portion 23 of the check 11 (Figure 2).

[0031] Additionally, in the phase of snap-coupling of the fork 10 to the check 11 in the fully closed position, when the tooth 18 is separated from the portion 23, the further angular movement of the check 11 under the pressure of the corresponding spring is limited by the contact with the arresting element 37, which, since it takes place with the interposition of the damping element 38, also has a low noise.

[0032] The locking of the fork 10 by the check 11 may take place either in the fully closed position or in the partially closed position, according to the force exerted on the door. In particular, the fully closed position is reached if the force exerted on the door causes a pressure on the fork 10 sufficient to bring the elastic element 32 into contact with the arresting element 30 and the tooth 18 beyond the engagement portion 23 of the check 11, while the partially closed position is reached if the force exerted on the door causes a pressure on the fork 10 sufficient to bring only the shoulder 24 beyond the engagement portion 23 of the check 11.

[0033] An examination of the characteristics of the lock 1 made according to the present invention will clearly reveal the advantages which it provides.

[0034] In particular, the bending of the elastic element 32 when in contact with the arresting element 30 produces a braking action on the return portion of the path for coupling the fork 10 to the check 11, and thus considerably reduces the noise of the subsequent impact of the tooth 18 against the engagement portion 23.

[0035] Additionally, the elastic element 32 does not form a supplementary element to be produced and fitted on the arresting element 30 or on the fork 10, but is made in one piece with the shell 14 of the fork 10 and therefore does not entail additional costs compared to known locks.

[0036] Finally, it is clear that the lock 1 may be subjected to modifications and variations which do not depart from the scope of protection of the present invention.

[0037] In particular, the lock 1 could be fixed to the jamb of the door and could interact with a stop which is integral with the door.

Claims

1. Lock (1) for a door of a motor vehicle, comprising a supporting casing (2) and a locking mechanism (4) carried by the said supporting casing (2) and capable of interacting with a stop (6), the said locking mechanism (4) comprising:

   - a fork (10) made, at least externally, from plastic material, hinged to the said supporting casing (2) about a first axis (A), provided with a socket (16) for a portion (5) of the said stop (6), and rotatable about the said first axis (A) between an open position, in which the engagement and disengagement of the said portion (5) of the said stop (6) with and from the said socket (16) is permitted, and at least one fully closed position, in which the said portion (5) of the said stop (6) is locked in the said socket (16); and
   - a check (11) hinged to the said supporting casing (2) about a second axis (B), pushed by elastic means towards a peripheral edge (22) of the said fork (10) and having an engagement portion (23) which can be snap-coupled to the said peripheral edge (22) to releasably lock the said fork (10) in the said fully closed position;

   the said supporting casing (2) comprising first stop means (30) capable of intercepting the said fork (10) in a stop position located after the said fully closed position along a forward portion of a path for coupling the fork (10) to the said check (11), and of causing a restraining reaction on the said fork (10) to move it into the said fully closed position along a return portion of the coupling path opposed to the said forward portion;

   characterized in that the said locking mechanism (4) comprises at least one elastic leaf spring element (32) made from plastic material, carried integrally by the said peripheral edge (22) of the said fork (10) and capable of bending when bearing against the said first stop means (30) at the end of the said forward por-

tion of the said coupling path to cause a braking action on the said return portion of the coupling path.

2. Lock according to Claim 1, characterized in that the said elastic leaf spring element (32) is of elongate form and comprises corresponding opposing end portions (33) integral with a section (34) of the said peripheral edge (22) of the said fork (10), and an intermediate portion (35) spaced apart from the said section (34) of the said peripheral edge (22) and delimiting with the latter a slot (36).

3. Lock according to Claim 2, characterized in that the said intermediate portion 35 of the said elastic leaf spring element 32 has a cross-section which is wider than the cross-section of the said end portions 33 and which projects towards the interior of the said slot 36.

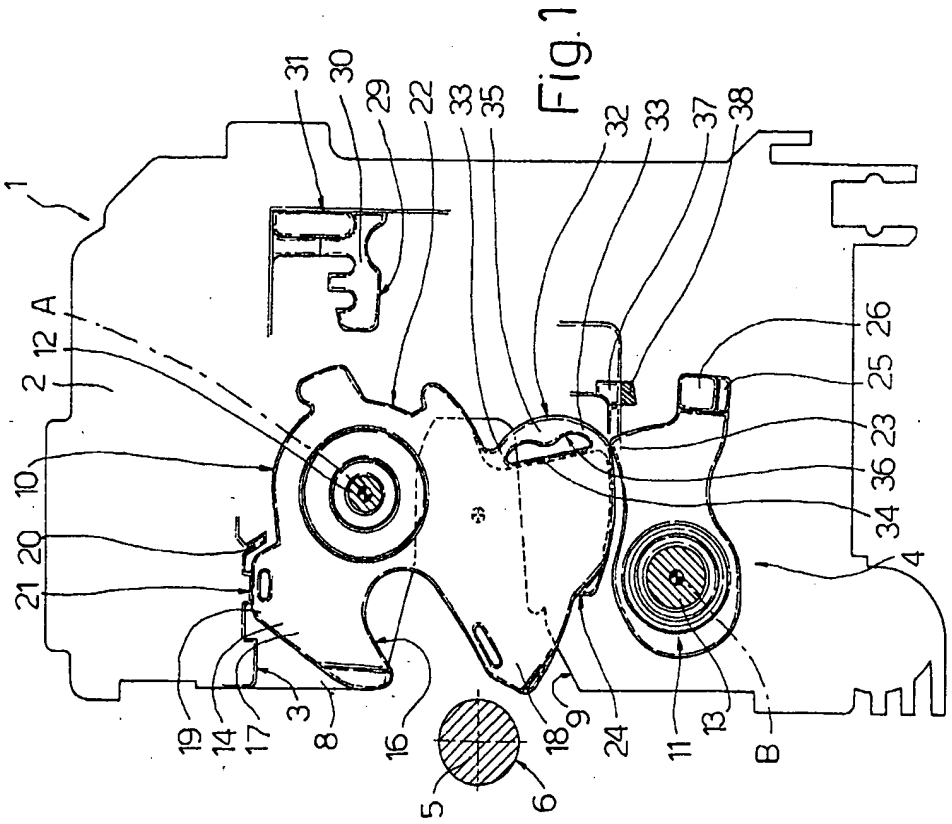
4. Lock according to any of the preceding claims, characterized in that the said supporting casing (2) forms within itself a compartment (3) in which the said locking mechanism (4) is housed, and in that the said first stop means comprise a stop element (30) projecting into the said compartment (3).

5. Lock according to any of the preceding claims, characterized in that it comprises second stop means (37) carried by the said supporting casing (2) and forming an end stop for the said check (11) in the angular position in which it locks the said fork (10) in the said fully closed position, and damping means (38) interposed between the said check (11) and the said second stop means (37).

6. Lock according to Claim 5, characterized in that the said damping means (38) comprise a rubber block carried by the said second stop means (37).

7. Lock according to any of the preceding claims, characterized in that the said fork (10) is made from metallic material and is covered externally by a shell (14) made from plastic material, and in that the said elastic leaf spring element (32) is made in one piece with the said shell (14).

Fig.1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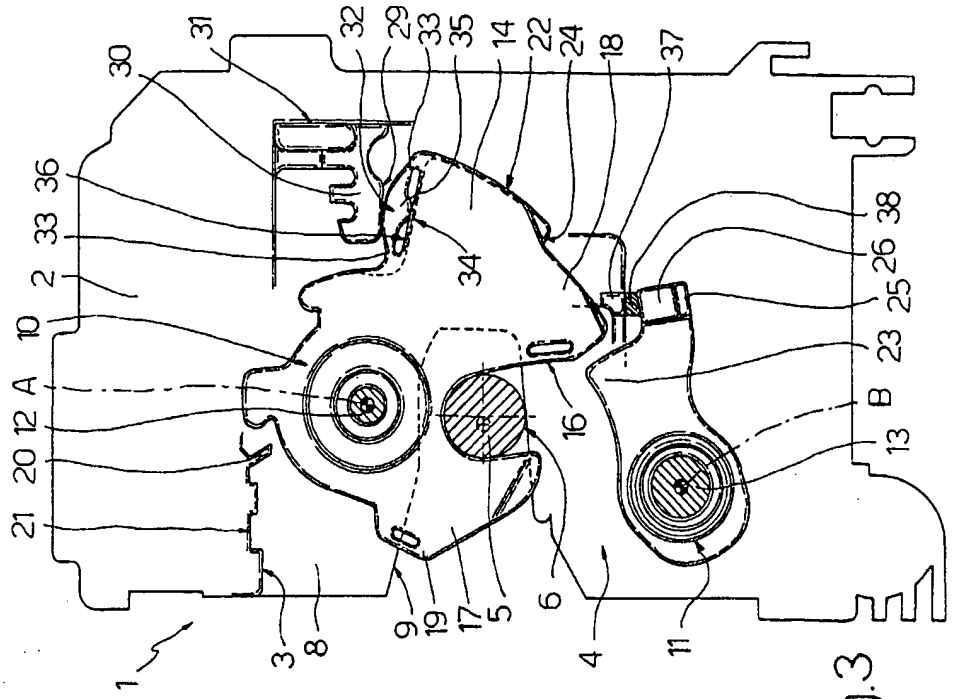
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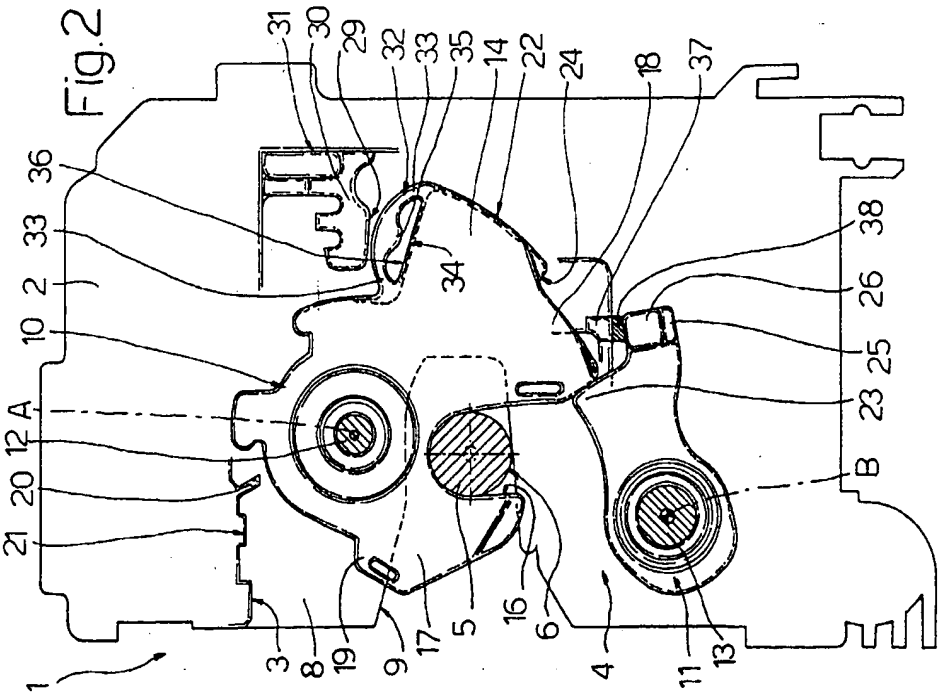
Fig.3

Fig.2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EUROPEAN SEARCH REPORT

Application Number
EP 99 12 0816

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	25 January 2000	PEREZ MENDEZ, J

CATEGORY OF CITED DOCUMENTS

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EUROPEAN SEARCH REPORT

Application Number
EP 99 12 0816

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THE HAGUE	25 January 2000	PEREZ MENDEZ, J

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